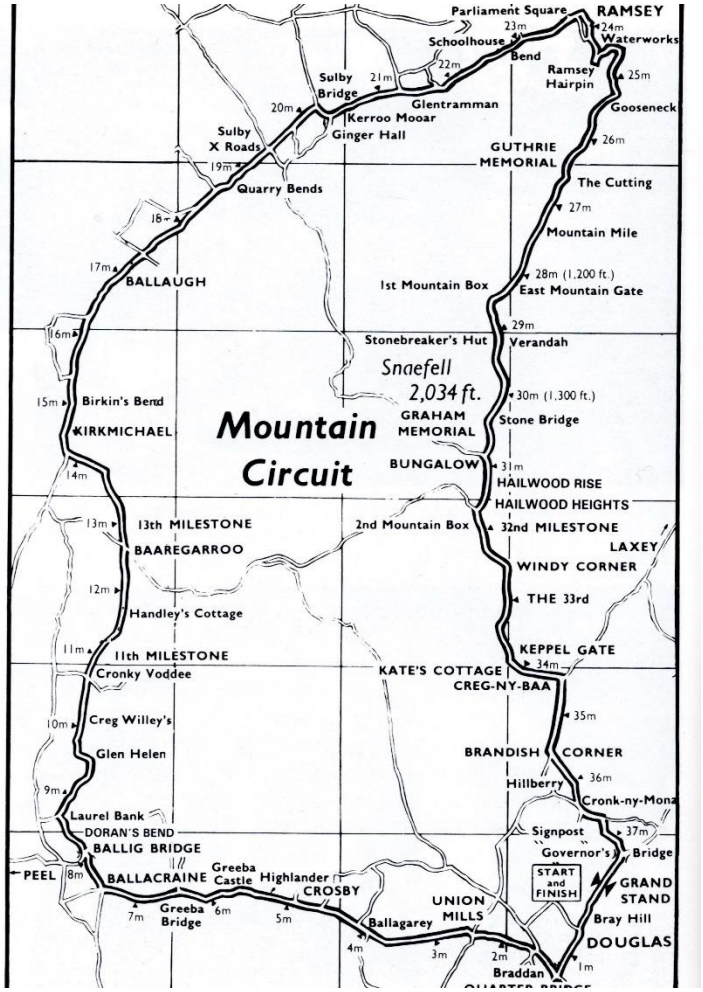
Note 138
Isle of Man TT Mountain circuit:- Course Records

Writing Note 137 about Indianapolis reminded this author that there is another circuit used for racing since 1911 which is *almost* unchanged – the Isle of Man Mountain circuit. This Note reviews the course records achieved there by Tourist Trophy motor-cycles and puts them in perspective with the machine Power/Weight ratios.

The Mountain course of 37.73 miles used since 1920* rises to a height of 1,400 feet. It had a large surface change from mostly loose to tarmacadamed by 1925 and has had many corners "eased" since then but its *plan* is essentially unchanged. Unlike Indianapolis, with its 4 left-hand quarter-circle corners, it has 264 bends of every description! The plan is shown below.

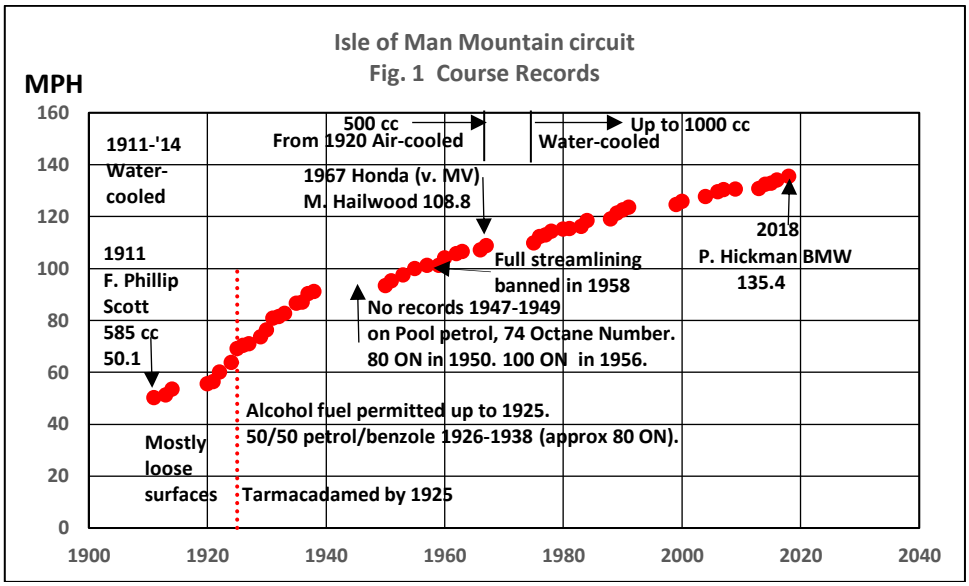


DASO 1246

**For the 1911-1914 races the course was 37.7 miles. In 1920 a change was made for the last few miles from Cronk-ny-Mona to bring the Start/Finish line onto the Glencrutchery Road.*

Course Record list

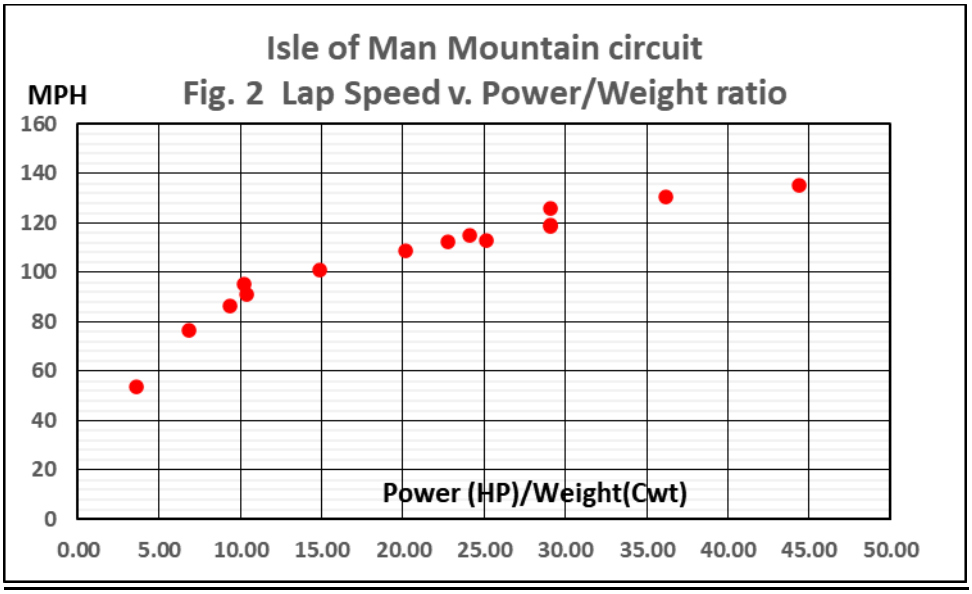
As there does not seem to be readily available a consolidated list of outright Course Records one has been assembled from various sources. It is given in Appendix A at P. 6. There may be omissions. The figures are plotted on Fig. 1 at P.2 below, with various appropriate notes.



Course Record Lap Speed (LS) versus machine Power/Weight ratio (PP/W)

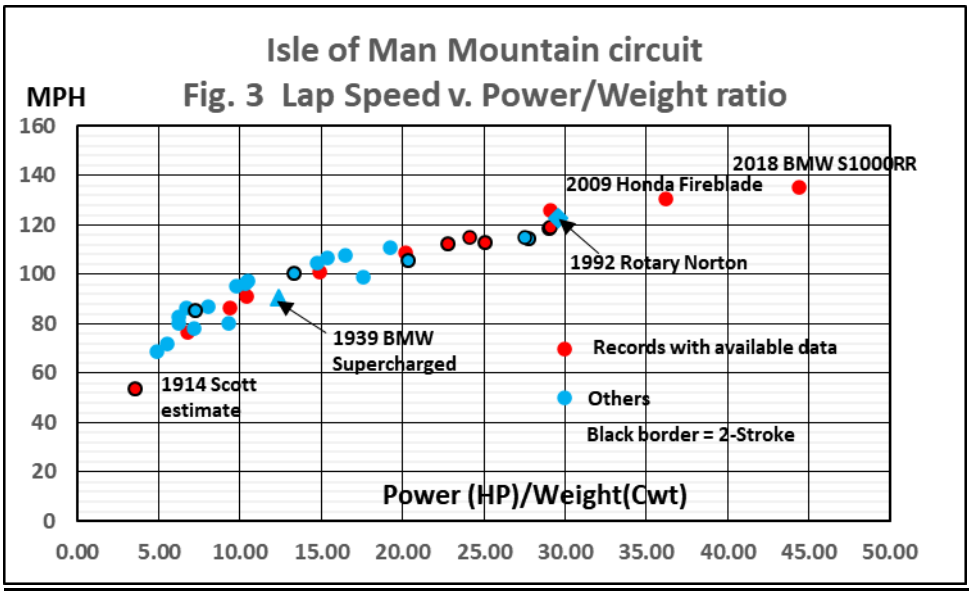
As was explained in Note 137 regarding Indianapolis, there cannot be a simple correlation of LS with PP/W over many years. This is because of *time-related* effects – that is to say, the constant application by racers of *other* changes to improve performance, before considering riders' skill, weather, or course "easing" for safety or even intended deliberately to raise speeds for "PR" reasons.

However, PP/W is not *un*-important. Accordingly, Fig. 2 presents a *picture* of LS v. PP/W for the cases where the data is reasonably well-known, as given on Appendix B on P. 7.



Additional data on "Other"

To give a more general picture of LS v. PP/W other cases have been added to the Course Record cases. The data is in Appendix C at P. 8 and the combined plot is Fig. 3 on P. 3.



LS v. PP/W *excluding* "Time-related" factors

By courtesy of Honda over 1966-1967, it *is* possible to produce a correlation of this sort at a particular date. The data are given on Appendix D at P. 8 and it is plotted on Fig. 4 below.*

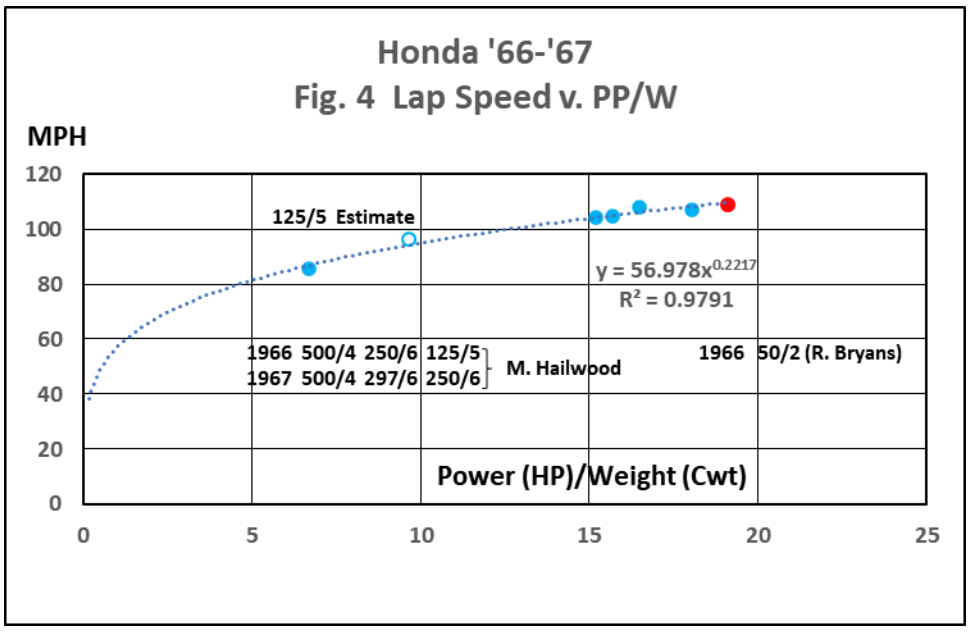
For small changes the curve means that +1% of Lap speed requires + 4.5% of Power/Weight**.

The curve predicts that an LS of 100 MPH would require a loaded PP/W = 12.6. In 1967 Bill Ivy (a lightweight rider) with a 4-cylinder 125 cc Yamaha 2-stroke with 13.4 (Appendix C) did 100.3 MPH.

**The figure for the 125/5 96 MPH is based on:-*

(5th place Race speed 95.07) x (Winner's Fastest Lap 98.55/Race speed 97.66).

***In 1951 the author carried out an identical analysis using 10 points for a range of machines/riders of that year with the best data then available. Replotted with a PC now the result was* $y = 50.5x^{0.25}$ with $R^2 = 0.867$.



The first "Ton" laps

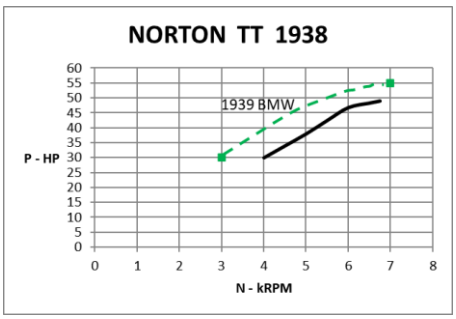
The first time a particular class reached 100 MPH around the IOM has always been of great interest to enthusiasts. A list is given below.

First "Tons"

Class	Rider	Machine	Year	Speed
500	Bob McIntyre	Gilera	1957	101.03
350	Gary Hocking	MV Agusta	1962	100.90
250	Phil Read	Yamaha	1965	100.01
125	Bill Ivy	Yamaha	1968	100.32
	and three others of interest:-			
1st 1-cylinder 500	Derek Minter	Norton	1960	101.05
1st Push-rod-valved 500	Tom Phillis	Norton Domiracer	1961	100+
1st Production	Malcolm Uphill	Triumph 750	1969	100.37

Comments

- Particularly for race-developed production motor cycles the power and weight data are not free from doubt. The author would be glad to be corrected on the data in Appendices B and C by visitors to the site who may have specialised knowledge, via "Enquiries".
- One time-related change in particular over 1950 to 2000 will have been the improvement of tyre friction co-efficient from 1 (Bank angle of 45^0) to 2 (63^0). But TT riders cannot use the most extreme bank angles seen in Moto GP, plus the body shifted right off the seat to move the C of G even further over, because the road is generally hard-edged not flat-kerbed.
- The first "Ton" lap by a single-cylinder 500 cc machine, given above, is an example of time-related changes which have taken place. Minter's Norton at 101.05 was close in specification to that ridden by Geoff Duke in 1951 to achieve a lap at 95.22 - 6.1% lap speed increase. Perhaps there was a power rise from 45 HP to 50, +11.1% (100 Octane fuel was available in 1956), worth on the evidence of Fig.4 about 2.4% of lap speed. Grant that the rider's skills were the same, that leaves +3.7% to other factors ("Dolphin" streamlining?; tyres?; "corner easing"?) over the 10 years.
- Three Machine Queries
    1. 1939 BMW.



The 90.3 MPH lap shown for the 500 cc supercharged BMW ridden by Georg Meier in 1939 was done in practice (DASO1248). To win the Senior TT he did not need to break the 1938 91 MPH Record, having his team-mate 'Jock' West in 2nd place with Freddy Frith 3rd on an ex-works 1938 Norton. The acceleration advantage of the BMW over the Norton was, firstly, a higher and wider power curve (see the chart, based on the *authentic* figures in DASO30). and, secondly, an 8.5% lower bike weight (302lb v.330). With 2 horizontal cylinders out in the air, the top speed was actually timed in practice on the Sulby straight as 1.3 MPH slower than Frith's Norton, when his lap time was 48 seconds less (DASO1248).

    2. 1950 Vincent Black Shadow.
    The 80 MPH lap speed shown for this machine (at PP/W = 9.29) is an estimate, as 1.4 MPH above the race-winning speed in the 1950 1,000 cc Clubman's TT class. From Fig.3 it was well below the general trend at its Power/Weight ratio. This was probably because its loaded weight of 663 lb, higher than any other bike in this review, was too much for the tyres of the time and speed was restricted accordingly.

3. 1957 Moto Guzzi V8
   The actual lap speeds of the 1957 V8 in the IOM are not available at this time, so 99 MPH at PP/W = 17.6 is notional as "Not quite reaching the Ton". As is well-known the bike went onto 7 cylinders but Dickie Dale rode it to finish 4th like that. There is little doubt that, although "Dolphin"-faired instead of the full cowling of the Gileras, it *could* have exceeded 100MPH easily if it had been *au point.*

- Singles v. Multis regarding flywheels
  A single-cylinder4-stroke engine at a given capacity is at a double disadvantage relative to a multi, *apart* from its basic inability to rev as fast:- it has to carry the weight of a flywheel sufficient to see it through 3 non-firing strokes. Obviously this reduces acceleration of the machine as a whole, but it also reduces the angular acceleration of the engine. Sometimes, on a slippery surface, this can be helpful. The author believes that Geoff Duke's famous crash on the 1953 Gilera on melted tar was caused by his momentarily forgetting that his 4-cylinder engine would spin up from a throttle opening much more rapidly than the Nortons which he had been riding his whole previous racing life.
  Probably the bad crashes in tests of the Moto Guzzi V8 with Fergus Anderson and Keith Campbell can also be put down to the exceptional rate of angular acceleration of the engine if adhesion was minimal. .

- A vital "Operational decision"
  Illustrating how riders in a race sometimes have to make critical "Operational decisions" (which nowadays are never disclosed in post-race PR appearances), Appendix E at P.9 reports one made by Harold Daniell in 1938.

Summary

Appendix A provides consolidated data on IOM Course Records from 1911 to 2019 and Fig. 1 charts this.

Appendices 2, 3 and 4 provide Lap Speeds versus Power/Weight ratio as "pictures" to help put the achievements into perspective.

Tribute

This Note 138 is a small tribute to many men (and a few women) who have risked their limbs and lives, and sometimes lost them, to satisfy an inner urge whatever the power of their machine to reach its highest speed round the World's most demanding racing circuit.

References

Details of Data Sources (DASO) can be found in Appendix 3 in this website

DASO:- 12,30,76,95,97,193,354,407,1190,1246,1247,1248,1249,1250.

A list of links to other articles on motor cycles in this website can be found on the cover page.

Appendices on PP 6 to 9.

Appendix A
Data for Fig. 1

Figures as established at end of TT week.
There may be omissions.

Year	Rider	Machine	Class cc	Lap Speed MPH	On Fig. 2 ?
1911	F. Phillip	Scott 2-Stroke (2S)	500	50.1	
1913	H. Wood	"	"	51.1	
1914	"	"	"	53.5	Yes
1920	G. Dance	Sunbeam	"	55.6	
1921	F. Edmond	Triumph	"	56.4	
1922	A. Bennett	Sunbeam	"	59.99	
1924	F. Dixon	Douglas	"	63.8	
1925	J. Simpson	AJS	"	69	
1926	"	"	"	70.4	
1927	S. Woods	Norton	"	70.9	
1929	C. Dodson	Sunbeam	"	73.5	
1930	W. Handley	Rudge	"	76.3	Yes
1931	J. Simpson	Norton	"	80.8	
1932	"	"	"	81.5	
1933	S. Woods	"	"	82.7	
1935	"	Moto Guzzi Bicilindrica	"	86.5	Yes
1936	"	Velocette MTT	"	87	
1937	F. Frith	Norton	"	90.3	
1938	H. Daniell	"	"	91	Yes
1950	G. Duke	Norton	"	93.3	
1951	"	"	"	95.2	Yes
1953	R. Amm	"	"	97.4	
1955	G. Duke	Gilera	"	99.97	
1957	R. McIntyre	"	"	101.1	Yes
1959	J. Surtees	MV Agusta	"	101.2	
1960	"	"	"	104.1	
1962	G. Hocking	"	"	105.7	
1963	M. Hailwood	"	"	106.4	
1966	"	Honda RC180	"	107.1	
1967	"	" RC181	"	108.8	Yes
1975	M. Grant	Kawasaki KR750 2S	750	109.8	
1976	J. Williams	Suzuki XR14 2S	500	112.3	Yes
1977	M. Grant	Kawasaki KR750 2S	750	112.8	Yes
1978	"	"	750	114.3	
1980	J. Dunlop	Yamaha.TZ750F 2S	750	115.2	Yes
1981	"	Honda ?	1000	115.4	
1983	N. Brown	Suzuki RG500 2S	500	116.2	
1984	J. Dunlop	Honda RS500 2S	500	118.5	Yes (Hidden by 1988)
1988	S. Cull	Honda RS500 2S	500	119.1	Yes
1989	S. Hislop	Honda RC30	750	121.3	
1990	"	Honda	750	122.6	
1991	"	Honda RVF750	750	123.5	

Appendix A continued on P.7

Appendix A continued

Year	Rider	Machine	Class cc	Lap Speed MPH	On Fig. 2 ?
1999	J. Moodie	Honda RC45	750	124.5	
2000	D. Jefferies	Yamaha YZF-R1	1000	125.7	Yes
2004	J. McGuiness	”	”	127.7	
2006	”	Honda Fireblade	”	129.4	
2007	”	”	”	130.3	
2009	S. Plater	”	”	130.5	Yes
2013	C. Donald	”	”	130.7	
2014	B. Anstey	”	”	132.3	
2015	J. McGuiness	”	”	132.7	
2016	M. Dunlop	BMW S1000RR	”	134	
2018	P. Hickman	”	”	135.4	Yes

Appendix B

Data for Fig. 2

General note: Nominal weights of 141 up to 213 lb have been added to Empty Dry Weight, as shown below, to allow for 1 lap's worth of Oil, Water (where required) and Driver (fully kitted. Figures allowing for known lightweights).

Where only a street weight is known a nominal 50 lb. has been deducted for race trim.

D = Data source, either DASO (D per Appx. 3) or from Internet (IN).
For this Appendix all speeds are from Appendix A.

LAP SPEED (MPH)	YEAR	RIDER	MACHINE	CLASS cc	POWER (P) HP D	WEIGHT(W) LB D	Cwt	P/W HP Cwt
53.5	1914	H. Wood	Scott	500	15*	265* +202	4.17	3.6
76.3	1930	W. Handley	Rudge	”	34.2 D12	370+195 IN	5.04	6.79
86.5	1935	S. Woods	Moto Guzzi	”	44 D1190	333+195 D1190	4.71	9.34
91	1938	H.Daniell	Norton	”	49 D407	330+195 D407	4.69	10.4
95.2	1951	G. Duke	Norton	”	45 Appx. 4	300+195 IN	4.48	10.2
101.1	1957	R. McIntyre	Gilera	”	70 D1190	330+195 D1190	4.69	14.8
108.8	1967	M. Hailwood	Honda RC181	”	95 D354	333+195 IN	4.71	20.17
112.3	1976	J. Williams	Suzuki XR14	”	100 D1247	298+192 D1247	4.38	22.8
112.8	1977	M. Grant	Kawasaki KR750	750	125 IN	350+207 D97	4.97	25.1
115.2	1980	J. Dunlop	Yamaha TZ750F	750	118 Wikipedia	335+213 Wikipedia	4.89	24.1
118.5	1984	J. Dunlop	Honda RS500	500	125 Appx. 4	287+195 IN	4.3	29.1
119.1	1988	S. Cull	Honda RS500	500	125 Appx. 4	287+195 IN	4.3	29.1
125.7	2000	D. Jefferies	Yamaha YZF-R1	1000	150 IN	364+213 IN	5.15	29.1
130.5	2009	S. Plater	Honda Fireblade	1000	178 IN	338+213 IN	4.92	36.2
135.4	2018	P. Hickman	BMW S1000RR	1000	220 Appx. 7	342+213 IN	4.96	44.4

* Estimated with 1914 Rudge power and 1926 Velocette weight.

Appendix C
Data for "Others" on Fig.3

Notes same as Appendix B.
In Lap Speed order to assist identification.

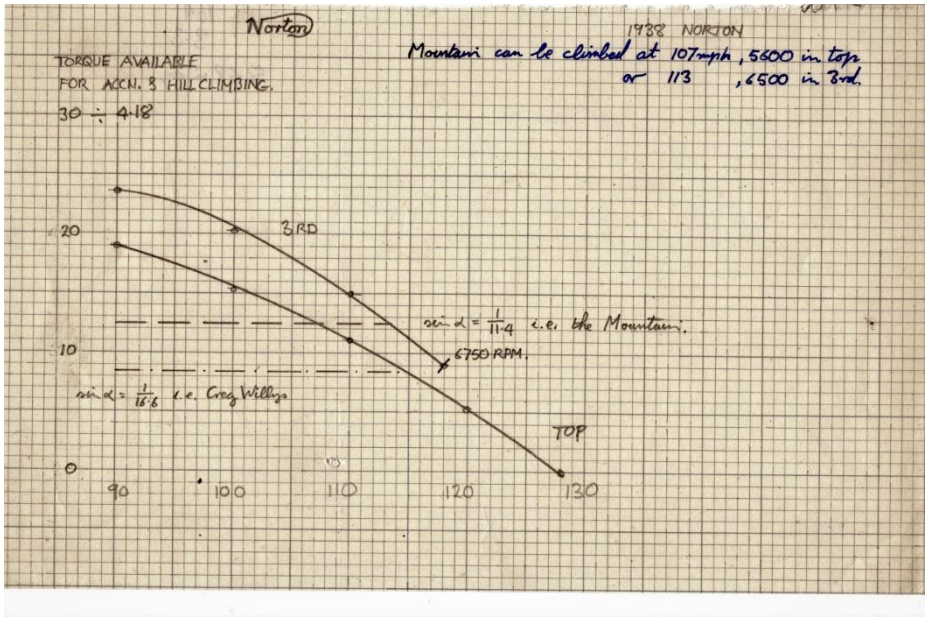
Year	1926	1931	1939	1939	1954	1954	1967	1966	1951	1939	1962
Make	Velocette	Rudge	Benelli	Velocette	Vincent	BSA	Suzuki	Honda	AJS	BMW	AJS
Model	KTT Mk 1			KTT Mk 8	B. Shadow	G. STAR	RK67	RC116	7R	255	7R
	350/1	500/1	250/1	350/1	1000/2	350/1	50/2	50/2	350/1	500/2 SC	350/1
Rider	A. Bennett	E. Nott	T. Mellors	L. Higgins			S. Graham	R. Bryans		G. Meier	
Power PP HP	20	22.1	30	29	55	32	17.5	16	34.5	55	42
Data source	Appx. 7	D12	D193	Appx. 7	Appx. 7	Appx. 7	D1247	D1249	Appx. 7	D30	Appx. 7
Dry Weight lb	265	256	275	325	458	380	128	128	285	302	285
Data Source	I/N	I/N	D193	I/N	I/N	I/N	D1247	D1249	I/N	D74	I/N
+ Load lb	195	195	195	195	205	195	141	141	195	195	195
Total Weight lb	460	451	470	520	663	575	269	269	480	497	480
Total Wgt W Cwt	4.11	4.03	4.20	4.64	5.92	5.13	2.40	2.40	4.29	4.44	4.29
PP/W HP/Cwt	**4.87**	**5.48**	**7.15**	**6.25**	**9.29**	**6.24**	**7.29**	**6.67**	**8.04**	**12.39**	**9.79**
Lap Speed MPH	**68.8**	**71.7**	**78**	**80**	**80**	**83**	**85.2**	**86.5**	**87**	**90.3**	**95**
Data source	D1246	D1246	D1248	Whitworth '39	Phillip '50	Palmer '54	D1246	D1246	F'stone '51	D1248	Duff '62
Year	1957	1957	1957	1968	1967	1968	1972	1978	1979	1981	1992
Make	M. Guzzi	Gilera	M. Guzzi	Yamaha	Honda	Yamaha	BSA	Ducati	Suzuki	Suzuki	Norton
Model				RA31A	RC166	RD05A	"S. Sam"	750SS	XR22	XR69	NRS588
	350/1	350/4	500/8	125/4 2S	250/6	250/4 2S	750/2	750/2	500/4 2S	1000/4	Rotary
Rider	Dale	McIntyre	Dale	W. Ivy	H'wood	W. Ivy	Pickrell	H'wood	M. Hailwood	Crosby	S. Hislop
Power PP HP	38	49	80	42	60	70	84	94	122	134	135
Data source	D1190	D1190	D1190	I/N	D97	I/N	I/N	Appx. 7	D1247	D1247	I/N
Dry Weight lb	216	330	297	209	260	243	418	353	299	350	298
Data Source	D1190	I/N	D1190	I/N	D97	I/N	I/N	I/N	D1247	D1247	I/N
+ Load lb	195	195	213	141	195	141	195	195	192	195	213
Total Weight lb	411	525	510	350	455	384	613	548	491	545	511
Total Wgt W Cwt	3.67	4.69	4.55	3.13	4.06	3.43	5.47	4.89	4.38	4.87	4.56
PP/W HP/Cwt	**10.35**	**10.45**	**17.60**	**13.40**	**14.78**	**20.40**	**15.40**	**19.20**	**27.8**	**27.50**	**29.6**
Lap Speed MPH	**96.1**	**97.4**	**99**	**100.3**	**104.5**	**105.5**	**106.7**	**111**	**114**	**115**	**122.3**
Data source	M. C'l'g	M. C'l'g	Approx.	D1246	D1246	D1246	D1246	D1246	D1246	I/N	I/N

Appendix D
Data for Honda machines over 1966 – 1967

Year	1966	1966	1966	1967	1967	1967	1966
Make	Honda	Honda	Honda	Honda	Honda	Honda	Honda
Model	RC180	RC166	RC116	RC181	RC174	RC167	RC149
V/CN	500/4	250/6	50/2	500/4	297/6	250/6	125/5
Rider	M. Hailwood	M. Hailwood	R. Bryans	M. Hailwood	M. Hailwood	M. Hailwood	M. Hailwood
Power PP HP	85	60	16	90	67	62	33
Data source	DASO1249	DASO1249	DASO1249	DASO1249	DASO1249	DASO1249	DASO354
Dry Weight kg	151*	112	58	151	118	112**	85
Dry Weight lb	333	247	128	333	260	247	187
Data Source	DASO1249	DASO1249	DASO1249	DASO1249	IN	DASO1249	IN
+ Load lb	195	195	141	195	195	195	195
Total Weight lb	528	442	269	528	455	442	382
Total Wgt W Cwt	4.71	3.95	2.4	4.71	4.06	3.95	3.41
PP/W HP/Cwt	**18.05**	**15.19**	**6.67**	**19.11**	**16.5**	**15.7**	**9.68**
Lap Speed MPH	**107.07**	**104.29**	**85.66**	**108.77**	**107.73**	**104.5**	**96**
Data source	DASO1250	DASO1250	DASO1250	DASO1250	DASO1250	DASO1250	Estimate
	*Assumed same as in 1967			**Assumed same as in 1966			

Appendix E

In "Racing Reminiscences" (Ed. G. Davison TT Special 1948) Harold Daniell described how in 1938 on his last lap climbing the Mountain he could "*Take care of the machine in Top, or thrash it in 3rd to go faster*". Reading this in 1952 the author, then the owner of a 3-gear 125 cc Bantam, could not understand this statement. So he then went into it in great detail with the known power curve and bike weight from DASO407, gear ratios, the drag curve suggested in DASO76 and the gradient of the Mountain from the OS map. The actual resultant plot is shown below and the Daniell comment fully understood. His choice was 107 MPH at 5,600 RPM in Top or 113 at 6,500 in 3rd. He chose the faster option, risking fatigue failure of an engine which had already raced for 2 ¾ hours. The rest of the anecdote is famous history - a 91 MPH lap to beat Stanley Woods on the Velocette MTT by 15 seconds.



The fastest lap to date

2018 Peter Hickman BMW S1000RR 135.452 MPH